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(54) **TRENCH MOSFET WITH INTEGRATED SCHOTTKY BARRIER DIODE**

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(57) **ABSTRACT**

A Schottky diode includes a semiconductor layer formed on a semiconductor substrate; first and second trenches formed in the semiconductor layer where the first and second trenches are lined with a thin dielectric layer and being filled partially with a trench conductor layer and remaining portions of the first and second trenches are filled with a first dielectric layer; and a Schottky metal layer formed on a top surface of the semiconductor layer between the first trench and the second trench. The Schottky diode is formed with the Schottky metal layer as the anode and the semiconductor layer between the first and second trenches as the cathode. The trench conductor layer in each of the first and second trenches is electrically connected to the anode of the Schottky diode. In one embodiment, the Schottky diode is formed integrated with a trench field effect transistor on the same semiconductor substrate.